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AUTHOR Hagerty, Patricia Jo
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ABSTRACT

A major purpose of this study was to determine whether a selected number of current, commercially prepared spelling series used high frequency words for their word lists. A second purpose was to determine whether students misspelled high frequency words in their writing. Eleven commercially prepared spelling series were selected according to the following criteria: copyright date of 1976 or later, availability at the beginning of the study, and publication in basal format with books for each grade level 2 through 6. Through systematic sampling, 100 words from each grade level of each series were chosen resulting in a total of 5,300 words. Words from students' writing were taken from writing samples by students in grades 3 and 5. "The American Heritage Word Frequency Book" was used to determine word frequency. Results showed that there were significant differences among the spelling series in their number of high frequency words based on a standard measure of word frequency. No one series had the highest number of high frequency words at each grade level. Also, no one series was consistent across grade levels in the number of high frequency words found at each grade level. Although grade 2 should have had the highest number of high frequency words, results showed that grade 3 had the highest number, while grade 4 had the second highest, followed by grades 2, 5, and 6. Finally, the high number of incorrectly samples suggests that students' writing serves as a potential source for spelling words. (HOD)

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Comparative Analysis of Selected High Frequency Words Found in Commercial Spelling Series and Misspelled in Students' Writing to a Standard Measure of Word Frequency

Patricia Jo Hagerty

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A major concern of elementary teachers in today's schools focuses around the teaching of spelling. Teachers become perplexed when students do well on weekly spelling tests, only to misspell the same words, as well as easier more common ones, in their written work.

The majority of teachers who teach spelling rely on some kind of commercial spelling series as a basis for their spelling programs (Graves, 1977). These series have not been particularly helpful to teachers. A quick examination shows them to be filled with procedures, activities, and word lists which largely ignore the research compiled in the field over the past four or five decades (Hinrichs, 1975). This research indicates that a good spelling program should include three components: a list of appropriate, high frequency words; efficient procedures by which these words are taught; and an effective method for the student to use when learning how to spell words (Hinrichs, 1975). In addition, the program must be supplemented with the development of a spelling conscience (a desire and concern to spell correctly), the ability to use a dictionary for spelling, and a great deal of writing (Hillerich, 1977).

It is fairly obvious that elementary teachers can determine for themselves whether a particular spelling program makes use of efficient procedures for teaching words, such as the self-corrected test and the test-study-test methods. They can also easily determine if a series

promotes an effective method for teaching students how to study the words. However, it may be more difficult for them to know whether the words are high frequency or not. The major purpose of this study was to determine whether a selected number of current, commercially prepared spelling series used high frequency words for their word lists. A second purpose of this study was to determine whether students misspelled high frequency words in their writing.

The questions to be answered included the following:

1. Are there differences among spelling series in high frequency words based on a standard measure of word frequency?

2. Are there differences within grade levels of spelling series in high frequency words based on a standard measure of word frequency?

3. Are words misspelled in children's writing at grades three and five high frequency words as determined by a standard measure of word frequency?

Related Research

Three areas of research are relevant to this study. The first concerns the words that students should be learning to spell. The second area deals with the use of computerized word lists, one of which was used in this study. The third deals with the placement of words by grade level in spelling series.

Several studies have been conducted for the purpose of determining which words should be included in a spelling program and, throughout the last five decades, research

has consistently shown that students should be learning to spell the words of highest frequency.

Thomas Horn, in his article on spelling in the Encyclopedia of Educational Research, reported that "there is as yet no field-tested substitute for direct instruction on the basic core of high frequency words needed in child and adult writing" (1969, p. 1285). Fitzsimmons and Loomer reported that "the spelling words of highest frequency in child and adult writing should be studied by elementary school children" (1978, p. 80); and Hinrichs (1975) reported that a good spelling program should concentrate on teaching children to spell words of highest frequency in the writing of both children and adults. Hillerich (1977) agreed with Horn, and Wenzel (1977) also reported that teachers should choose basic high frequency words for children to learn to spell.

The search for high frequency words through the years can be well documented. Perhaps the most significant study to identify words frequently used by adults in their writing was conducted in 1926 by Ernest Horn. In Horn's study, he combined the words from earlier adult vocabulary studies with his own research to select the 10,000 words most commonly used in adult writing. The source for his own research included business letters, personal correspondence, letters of application, letters to newspapers and magazines, minutes of meetings, and written exercises.

In all, over 5 million running words and 36,373 different words were tabulated. Horn's results indicated that a small number of words in our language were used over and over again. Over half of the adult writing was comprised of a representation of just 100 words, and 1,000 words accounted for about 90 percent of all words written. He also found that 2,000 words accounted for 95 percent of an adult writing vocabulary, while 4,000 words represented about 98 percent of the words used.

A second study which has had a great impact on the development of a core vocabulary for spelling was completed in 1945 by Rinsland. More than 200,000 individual samples of children's writing were gathered, and from these, over 6 million running words and over 25,000 different words were recorded. Rinsland's results were almost identical to Horn's: 100 words comprised approximately 60 percent of all children's writing, while 1,000 words accounted for 90 percent of all words written, and 2,000 words accounted for 95 percent of all words written. The same 3,000 words most frequently used by adults in Horn's study accounted for over 97 percent of the words written by children in this study.

Thorndike and Lorge (1944), Fitzgerald (1951), Hillerich (1978), and Thomas (1974, 1979) also used children's and/or adult's writing to develop lists of high frequency words. From their studies, as well as Horn's

and Rinsland's studies, it is evident that there is considerable overlap between the words found in the writing of children and adults. Based on these data, it has been suggested that a basic spelling list need not contain more than 3,000 to 4,000 words of highest frequency (Horn, 1969). Hinrichs (1975) and Allred (1977) agreed that a good spelling program should concentrate on teaching the 3,000 to 4,000 words of highest frequency, while Hillerich (1977) stated that a basic list need not contain more than 2,500 to 3,000 words.

Greene (1954) approached the study of word frequency in another way. His study attempted to determine the level of difficulty of a list of 5,507 words taken from Horn's (1926), Thorndike and Lorge's (1944), or Rinsland's (1945) lists. A sample of 230,000 children in grades two through eight were asked to spell selected words. Data was reported in a format that showed, for each of the 5,507 words, the percent of pupils in each grade who spelled that word correctly.

In addition to high frequency word lists developed from the writing of children and adults, there have been comprehensive computerized studies of word frequency based on printed material. Using adult printed material, Kučera and Francis (1967) selected 500 samples of approximately 2,000 words each, for a total of 1,014,233 running words and 50,406 different words. They compiled a rank list and

an alphabetical list of all words, as well as entries which indicated the total number of occurrences for a word throughout the entire corpus. The most frequent word, the, occurred 69,971 times.

A second major study of word frequency using a computer was compiled by Carrol, Richman, and Davies in 1971. Results of this study were published in The American Heritage Word Frequency Book. This book contains a collection of 86,741 different words drawn from a variety of instructional materials, including textbooks, workbooks, basal readers, magazines, trade books, and kits. These materials spanned 17 different subject areas in grades three through nine.

To select the 86,741 words, 5.5 million running words were drawn from 10,000 samples of 500 words each. The samples were selected from 1,000 of the 6,162 different titles of instructional materials identified in a national survey of public and private school systems across the United States. Words were printed out in both rank order and alphabetical order together with the grades at which they appeared and the subjects in which they were found. In addition, each word was given a Standard Frequency Index (SFI) which is a statistically estimated frequency indicating the number of times that word will be found by the average American student in all textbooks. The validity of using the Standard Frequency Index to determine the frequency of a word has been demonstrated by Finn (1977, 1977-78).

He used the SFI to determine whether words students used in cloze tests and in essays were high frequency words or low frequency words.

The question of grade level placement of spelling words has long been a subject of research in spelling. As early as 1934, Wise found great differences in the grade level placement of words when comparing 20 spelling textbooks.

In 1940, Betts published the results of the first of two investigations comparing word placement in spelling textbooks. Each of the 17 series studied introduced an average of 3,700 words, of which only 543 were common to all series. Only one word of the 3,700 was placed in the same grade level by all series.

In the second investigation Betts (1949) found the average number of words introduced by each of eight series to once again be around 3,700. Only 483 words were common to all series and only 65 words were placed at the same grade level by all series.

Ames (1965) conducted a study to determine the extent to which current spelling textbooks agreed on the inclusion of words in their total programs as well as the grade placement of those words. Using seven series, Ames found that each introduced an average of 3,209 words from grades two through eight. A total of 6,043 different words were found in the series, with 1,293 common to all seven series.

The grade level placement of only 120 words was agreed upon by all series. Ames also found great variation in grade placement for certain words; in some cases, there was a range of as many as five grade levels in the placement of words in the seven series.

Hinrichs (1975) expressed concern that most words used in commercial spelling series gave little thought to word difficulty and frequency, but were selected for use in a list because they conformed to a particular generalization that was being emphasized. He stated that the words chosen for a particular grade level should be those that meet the writing needs of students at that level. These words should also be difficult enough to challenge most of the students at that grade level but not so difficult that they prohibit mastery by most of the class.

From the research, it is evident that students should be learning how to spell high frequency words, and such lists are available. In addition, the research indicates that spelling series do not agree on the grade level placement of words. Therefore, it is questionable whether spelling series use high frequency words at each grade level.

Selection of Word Samples

To address the first two research questions, words needed to be selected from different grade levels in spelling series. For the third research question, misspelled words

needed to be selected from students' writing.

Eleven commercially prepared spelling series were chosen for inclusion in this study. All series were selected according to the following criteria:

1. Copyright date of 1976 or later.

2. Availability at the beginning of the study.

3. Publication in basal format with books for each grade level two through six. It should be noted that three series had a formal spelling program at grade one, but the research question dealt with grades two through six. Series included in the study are listed in Appendix A.

Through systematic sampling, 100 words from each grade level of each series were chosen for evaluation in this study. A total of 5,500 words were chosen, 500 from each series.

Words from students' writing selected for evaluation in the study were taken from writing samples by students in grades three and five from a school district in Colorado. Over 100 samples at each grade level were systematically selected for use. Once a sample was chosen for inclusion, it was read until the first misspelled word was found and recorded, until 100 words from each grade level, three and five, were recorded for evaluation. If the first misspelled word on any sample was previously recorded, the second misspelled word was found and recorded and so on. If a selection contained no misspelled word, it was discarded.

Selection of the Standard Measure of Word Frequency

To determine word frequency for this study, The American Heritage Word Frequency Book (Carroll, Richman, Davies, 1971) was used. To establish a standard measure of word frequency (Standard Frequency Index) for each grade level, several steps were followed. First, the total number of different words at each grade level in the eleven spelling series was found. Each series was assigned a letter from A to K. For each grade level the same procedure was used. Words from Series A were alphabetically listed. Any words found in Series B that were not found in Series A were added to the list. Any words found in Series C that were not yet on the list were also added. This procedure continued until the total number of different words across all series, A through K, at each grade level was determined.

The total number of different words found at each grade level across all series was then added to the total number of different words found at each preceding grade level to determine the accumulative total at each grade level. Once these accumulative totals were found, an additional adjustment was required. In many instances, it was found that a word counted in the total number of different words at grade two might also have been included in the count of the total number of different words at grade three and again at grade four. This was possible

since one series introduced a word at grade two and a second series introduced that same word at grade three, while another series introduced it at grade four. This word then would have been included inthe total number of different words found at all three grade levels. As a result, the accumulative totals at each grade level were inflated.

To adjust for this inflation, at least 100 words at each grade level were systematically selected from the total number of different words at each grade level. The number of systematically selected words ranged from 102 to 110, depending on the total number of different words at each grade level. These words were than compared with the total number of different words at each preceding grade level. If one of these words was found to be on the list of words for a preceding grade level, it was discarded.

The percentage of the words not found at a preceding grade level was used to adjust the total number of different words at each grade level. For example, each of the 109 words systematically selected from the total number of different words found at grade three was compared with the total number of different words found at grades one and two. Forty-six of the 109 words were found on those lists and were discarded. Since 63 of the 109 words were not found to be on a preceding grade level's list of different words, 58 percent (63/109) of the original total number of

different words found for grade three was calculated. As a result, a new total number of different words for grade three was determined. This procedure was carried out until the total number of different words at each grade level was adjusted. The adjusted total number of different words and adjusted accumulative totals are presented in Table 1.

As a final step in determining the standard measure of word frequency for each grade level, the adjusted accumulative total at each grade level was located on the Rank List in The American Heritage Word Frequency Book (Carroll, Richman, Davies, 1971). The Standard Frequency Index corresponding to that ranking was selected as the Standard Frequency Index for that grade level. For example, the Standard Frequency Index for grade two was determined. by locating the word ranked at 1,186 (the adjusted accumulative total for grade two on the Rank List. The Standard Frequency Index for that word, 58.5, was selected as the standard measure of word frequency for grade two. Table 2 shows the Standard Frequency Index established for each grade level.

Data Collection for Spelling Series

To determine if a systematically selected word at a particular grade level in a particular series was a high frequency word, its recorded Standard Frequency Index was

compared to the Standard Frequency Index established for that grade level. If the Standard Frequency Index for a particular word was equal to or greater than the Standard Frequency Index established for that grade level, it was considered to be a high frequency word for that grade level. For example, the Standard Frequency Index for grade four established at 51.5. In Series A, grade four, the word across had a recorded Standard Frequency Index of 65.6. Since its Standard Frequency Index was higher than the Standard Frequency Index established for grade four, it was considered to be a high frequency word for that grade level. In Series I, grade four, the word unruly had a Standard Frequency Index of 35.0. Since its Standard Frequency Index was lower than the Standard Frequency Index established for grade four, it was considered to be a low frequency word for that grade level. The same procedure was repeated until all systematically selected words at each grade level, two through six, were evaluated.

Data Collection for Writing Samples

To determine if a misspelled word from a writing sample was a high frequency word for that grade level, its recorded Standard Frequency Index was compared to the Standard Frequency Index established for that grade level. If the Standard Frequency Index of a particular word was equal to or greater than the Standard Frequency Index established for that grade level, it was considered to be a high

frequency word. If it was lower than the Standard Frequency Index established for that grade level, it was considered to be a low frequency word.

Data Analysis

The first two research questions were tested using a two-factor analysis of variance. The Tukey method was used to make comparisons among the means. Significant levels of acceptance were set at $p \leq .05$.

The third research question was tested by using two t-tests, one for each grade level. Significant levels of acceptance were set at $p \leq .05$.

Results

Individual and average means of high frequency words by series and grade levels were calculated. (See Table 3). Since there were differences in the means both within and across series and grade levels, analysis of variance (ANOVA) was used to determine levels of significance.

Table 4 shows that there was significance at the .001 level among the series, within the grade levels, and the grade level by series interaction.

Since there was significance among series, a multiple-comparison test was used to determine which series were significantly different from other series. The Tukey Method of multiple comparison was used since equal n's were involved and pair-wise comparisons were needed. Results

showed that four series (A,E,F, and K) were significant when compared to other series. Each of these series was more significant than at least five other series. Series B was the next most significant series, showing a significant difference when compared to four other series, while Series J was less significant, showing a significant difference when compared to only two series. Series C, D, G, H, and I were the least significant series; they showed no significant difference when compared to any series.

Since there was also a significant difference (.001) within grade levels, the Tukey Method was again applied to the grade level means. The results showed grade three to be the most significant when compared to other grade levels. Grade four was the next most significant grade level, showing a significant difference when compared to one other grade level (grade six). Grades two, five, and six were the least significant, showing no significant difference when compared to any other grade levels.

Interaction. The interaction between grade level and series was significant at the .001 level. (See Table 4). To determine where the significance was, the interaction was graphed and is shown in Figure 1. An analysis of the interaction showed that no one series had the highest number of high frequency words at each grade level.

To test the differences between high frequency spelling words in grades three and five and the number of high

frequency words misspelled in student writing, a *t*-test was used. At grade three, results of the Welch *t*-test, given in Table 5, show that no significance was found between the two means at the .05 level.

Table 6 depicts the Welch *t*-test for grade five. There was a significant difference between the two means at the .05 level. It is evident from this test that the number of high frequency words misspelled in fifth grade writing samples is much higher than the number of high frequency words found in fifth grade spelling series.

Conclusions and Implications

One conclusion of this study was that there are significant differences among the spelling series in their number of high frequency words based on a standard measure of word frequency. Four series were ranked the highest when compared to the eleven series evaluated. No one series had the highest number of high frequency words at each grade level. Also, no one series was consistent across grade levels in the number of high frequency words found at each grade level. Rather, they showed variations. For example, the series that had the highest number of high frequency words at grade three had the third lowest number at grade four, and the series with the highest number of high frequency words at grade two had the second-lowest number of such words at grade six.

A second conclusion was that there are differences within grade levels of spelling series in their number of high frequency words based on a standard measure of word frequency. Although grade two should have the highest number of high frequency words, this was not found to be true. Results of the Tukey multiple-comparison test showed that grade three had the highest number of high frequency words, while grade four had the second highest, followed by grades two, five, and six.

These findings raise doubts as to the feasibility of using commercial spelling series as a source of spelling words for students in grades two through six, since it would be necessary to purchase a number of series in order to provide students with a list of appropriate, high frequency words at each grade level.

The question still remains as to where teachers should look to find spelling words for their students. A strong possibility is students' writing. The results of the grade five writing samples indicate that fifth graders were spelling incorrectly many high frequency words. Teachers could use the misspelled words from students' writing to individualize word lists or build classroom word lists. Students could have their own spelling dictionaries based on the misspelled words in their writing.

Other possible sources for spelling words are the

frequency lists. The 3,000 to 4,000 high frequency words essential in any spelling program can be selected from the ungraded lists of Horn (1926), Rinsland (1945), Hillerich (1978), Fitzgerald (1951), Kučera and Francis (1967), and Carroll, Richman, and Davies (1971) or from the graded lists by Thomas (1974, 1979) and Petty (1959).

In addition, words can be selected from The New Iowa Spelling Scale (Greene, 1954). This scale alphabetically lists high frequency words and gives the percentage of students in grades two through eight who spelled the words correctly. Teachers can use the percentages to develop word lists for students at a particular grade level or ability level.

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APPENDIX A

Series Label	Series Name	Publisher	Copyright Date
A	Rand McNally Spelling Program	Rand McNally and Co.	1980
B	The World of Spelling	D.C. Heath and Co.	1978
C	Spell/Write	Noble and Noble, Inc.	1976
D	Spelling Skill	Sadlier/Oxford	1978
E	Basic Spelling	J. P. Lippincott Co.	1977
F	Spell Correctly	Silver Burdett Co.	1980
G	Follett Spelling	Follett Publishing Co.	1981
H	Basic Goals in Spelling	McGraw-Hill, Inc.	1980
I	Spelling: Words and Skills	Scott, Foresman	1978
J	Growth in Spelling	Laidlaw Brothers	1979
K	Working Words in Spelling	Curriculum Associates	1979

Table 1

Adjusted Accumulative Total Number of Different Words At Each Grade Level Across All Series

Grade level	Number of different words	Adjusted accumulative totals
1	210	
2	976	1,186
3	1,279	2,465
4	1,616	4,081
5	1,591	5,672
6	1,643	7,315

Table 2

Standard Frequency Index Established for Each Grade Level

Grade level	Standard frequency index
1	66.6
2	58.5
3	54.6
4	51.5
5	49.2
6	47.4

Table 3

Individual and Average Means of High Frequency Words by Series and Grade Levels

	Grade Level						
Series	2	3	4	5	6	Mean	SEM
A	.73	.85	.79	.78	.70	.770	.019
B	.71	.86	.59	.70	.62	.696	.020
C	.37	.47	.81	.70	.67	.604	.021
D	.63	.68	.62	.51	.60	.608	.022
E	.71	.79	.84	.78	.68	.760	.019
F	.70	.74	.81	.79	.75	.758	.019
G	.60	.71	.50	.56	.57	.588	.022
H	.69	.67	.64	.51	.43	.588	.022
I	.63	.63	.56	.61	.59	.604	.022
J	.83	.80	.72	.61	.51	.694	.020
K	.74	.75	.82	.75	.74	.760	.019
Mean	.667	.723	.700	.664	.624		
SEM	.014	.014	.014	.014	.015		

Table 4

Analysis of Variance--High Frequency Words by Grade Level and Series

Source of variation	DF	Mean square	F	Significance
Series	10	3.044	14.573	.001
Grade level	4	1.575	7.543	.001
Grade level by series	40	.792	3.794	.001
Residual*	5445	.209		.001

*Variance among words nested within grade level and series.

Table 5

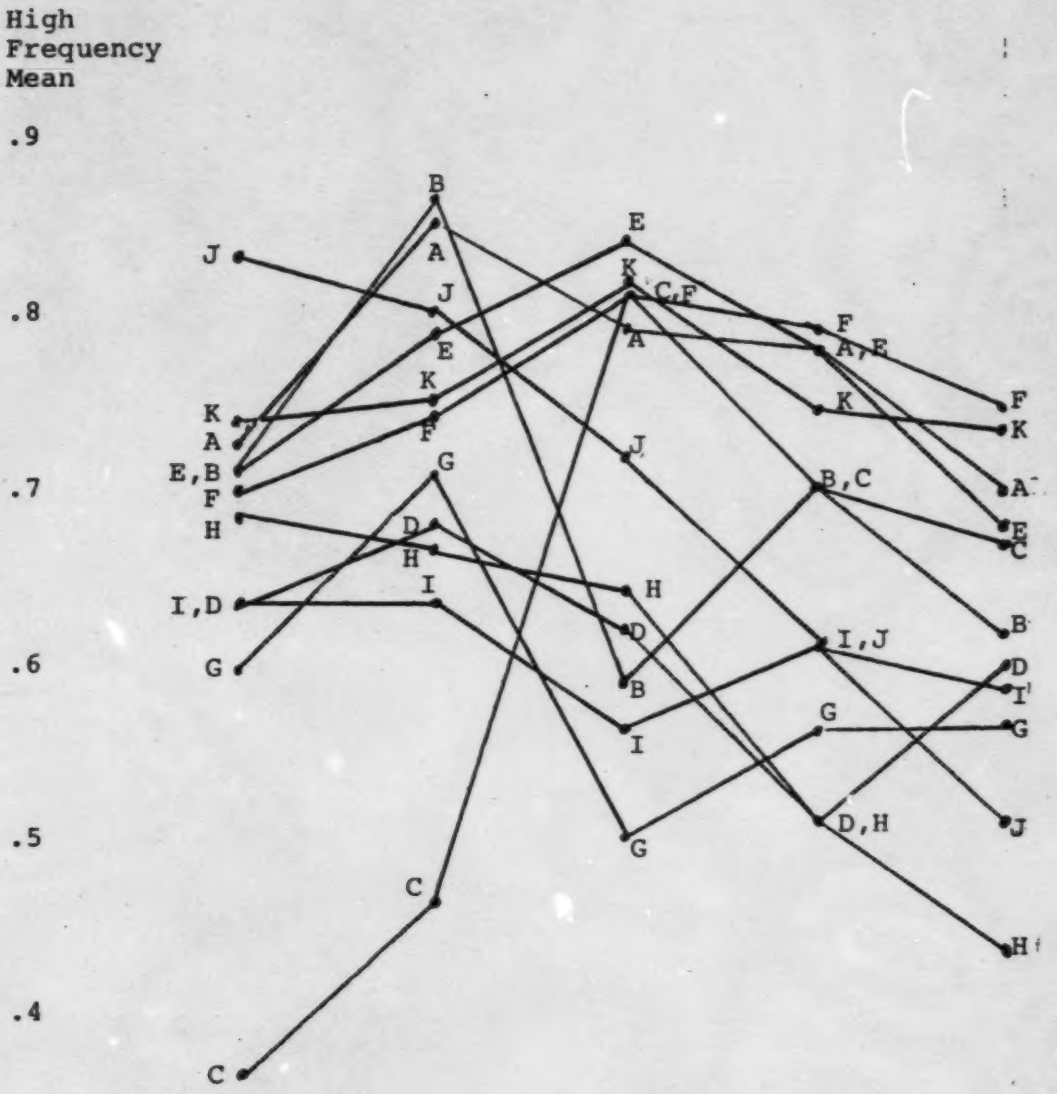
t-Test
Proportion of Third Grade High Frequency Words and Misspelled Words in Third Grade Writing Samples

Group	n	Mean	Welch t-value	Degrees of freedom	2-Tail Probability
Spelling series	1100	.7227	1.84	114.87	p = .068
Writing samples	100	.6300			

Table 6

Proportion of Fifth Grade High Frequency Words and Misspelled Words in Fifth Grade Writing Samples

Group	n	Mean	Welch t-value	Degrees of freedom	2-Tail Probability
Spelling series	1100	.6336	-2.13	121.90	p = .035
Writing samples	100	.7600			



	2	3	4	5	6
Mean	.667	.723	.700	.664	.624
SEM	.014	.014	.014	.014	.015

Figure 1. Two-way interaction between grade level and series